

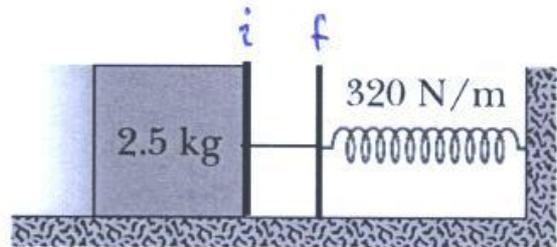
A 2.5 kg block slides head on into a spring with a spring constant of 320 N/m. When the block stops, it has compressed the spring by 7.5 cm ( $\mu_k = 0.25$ ). While the block is in contact with the spring and being brought to rest,

- a) What is the work done by the spring force between i and f?

$$W_s = \frac{1}{2} k (x_i^2 - x_f^2)$$

$$= \frac{1}{2} k (0 - 0.075^2)$$

$$= -\frac{1}{2} (320) (0.075)^2 = \boxed{-0.9 \text{ J}}$$



- b) What is the work done by the gravitational force between i and f?

$$W_g = 0$$

because  $\vec{F}_g$  is  $\perp$  to the displacement vector.

- c) What is the work done by the frictional force between i and f?

$$W_f = -f_k d = -\mu_k N d = -\mu_k m g d$$

$$= - (0.25) (2.5) (9.8) (0.075) = \boxed{-0.46 \text{ J}}$$

- e) What is the block's speed just as it reaches the spring?

$$W_{net} = \Delta K$$

$$-0.9 - 0.46 = \frac{1}{2} m (v_f^2 - v_i^2)$$

$$-1.36 = -\frac{1}{2} (2.5) v_i^2$$

$$\Rightarrow v_i = \sqrt{\frac{2 \times 1.36}{2.5}} = \boxed{1.1 \frac{\text{m}}{\text{s}}}$$